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Computational fluid dynamic analysis of the effect of kink conduit in microvascular vein grafting

Abstract

Arterial disease of the upper extremity is an uncommon occurance, most commonly caused by atherosclerosis. In some patients with arterial disease, surgical bypass by vein grafting or vein interposition may be performed. However, due to the length kink between the existing artery and applied vein graft or more of the length of the applied vein graft may get blocked or severely narrowed. The objective of this study is to investigate the influence of blood flow on a failed vein graft due to length kink. The 3-D computational fluid dynamic method was employed to determine pulsatile flow velocity, pulsatile pressure gradient, and wall shear stress impact on the mismatched diameter of artery-vein graft model. We expect that pulsatile flow velocity, pulsatile pressure gradient and wall shear stress impact on mismatched diameter of artery-vein graft model to behave non-hydraulically compared to an ideal length model.

Keywords

Computational fluid dynamic; Digital artery disease; Numerical method; Upper extremity; Vein graft survival